Comet ISON FAQs (11/20/13)

Here are a few of the most frequently asked questions we have received. If these don't help you answer your questions, please contact us and **we will** get back to you (and may add your question to the list here!).

About Comets

Q. What are comets?
A. Comets are relatively small solar system bodies, perhaps the ancient remnants of failed planets, which inhabit orbits in two regions: one is just outside the orbit of Neptune (home of Kuiper Belt comets). The second is an area much, much further away (home of Oort Cloud comets).

Q. What are comets made of?
A. Comets are loose collections of various ices, rock, and entrapped dust. They are composed largely of water ice but also contain much smaller amounts of *carbon monoxide (*CO), *carbon dioxide* (CO_2), methane, ammonia and other volatiles.

Q. Why do comets have tails?
A. Far from the Sun, in the icy cold outer solar system, comets do not have tails. It is only when their orbits take them close to the Sun that a tail forms. Comet tails form when the heat from the Sun vaporizes (sublimates) the comet's ices. The resulting gasses, along with the release of dust trapped in the ice, are blown outward by a combination of solar radiation pressure and the solar wind.

Q. How do comets get their names?
A. Comets are generally named after the person or people who discovered them, though there are exceptions. Although observed by Chinese, Babylonian, and Europeans as far back as 240BCE, Halley's Comet was "officially" discovered by the English astronomer Edmond Halley in 1705. He correctly concluded that previous sightings of a comet in 1531, 1607, and 1682, were in fact the same comet. Comet ISON was discovered on September 21, 2012, by Vitali Nevski and Artyom Novichonok using the International Scientific Optical Network (ISON).

Q. What can comets tell us about the Earth and the solar system?
A. Because comets are the remains of planet-forming processes that took place over four billion years ago, they can tell us much about the conditions in the early solar system. By observing comets, scientists can make educated guesses about conditions in the early solar system such as composition, collision rates, and formation processes.

Q. Have we ever sent a spacecraft to a comet?
A. Yes! NASA, ESA, and the Russian Space Agency have all sent spacecraft to observe (and sample) comets. Nine flybys of comets have already taken place. The first was the ICE spacecraft that visited comet Giacobini-Zinner in 1985. ESA's Rosetta spacecraft is on its way to comet Churyumov-Gerasimenko and is scheduled to land on that comet in November 2014.

About Comet ISON

Q. How big is Comet ISON?
A. We don't have a definite figure on this yet, but we do at least have a range. Observations from the Hubble Space Telescope put an upper limit of about 1.2 miles (2 kilometers) for the radius of Comet ISON's nucleus, while observations from the Spitzer Space Telescope indicate that ISON's nucleus has to be at least 0.12 miles (200-meters) in diameter. So we know that it's somewhere in this range, which makes it a somewhat smaller-than-average to an average-sized comet. This is the size of the comet nucleus (solid portion). A comet's tail can stretch to over a million kilometers in length.

Q. How bright will Comet ISON get?
A. If we could answer this with certainty, we would also be able to give you next week's winning lottery numbers! Even though the comet continues to brighten, we simply do not know yet how bright it will be in the hours surrounding its closest approach to the Sun.

Q. How bright is Comet ISON right now?
A. Every week or so we update our Comet ISON "light-curve", which you can find on the Comet ISON "Current Status" webpage.

Q. What is so special about Comet ISON?
A. In many respects, Comet ISON is much like many of the few thousand comets we already know of. It is a loosely-packed mixture of dust and gasses, trapped in a low-density ice ball. It is not even a very big comet (see above). But there are two very interesting aspects to it: First, it is a Sungrazing comet; and second, it is fresh from the Oort Cloud, making its very first (and only!) pass around the Sun. The combination of these two features makes ISON a rare comet and thus an observing target rich with scientific potential.

Q. Where did Comet ISON come from?
A. Comet ISON is what is known as a long-period comet, which means it comes from the scattered disk of debris in the Oort Cloud region, near the boundary of our solar system. A gravitational shoving match with another object out there jolted it out of its orbit and sent it sailing toward the inner solar system. Conversely, short-period comets are the kind you see returning to the inner solar system again and again, like Halley's Comet. Long-period comets only appear once and are gone forever. They either get ripped apart by the Sun or end up back adrift in the Oort Cloud.

Q. Why is its origin important?
A. Some of the most famous comets are long-period comets. They have a lot of volatiles like ammonia and methane stored in abundant water ice, and when they encounter the Sun they have a lot more material to burn off than comets that visit repeatedly. This makes them very bright.

Q. Where is Comet ISON in the sky right now?
A. Obviously this question is time dependent... Comet ISON is currently visible using moderate-sized telescopes and binoculars for observers with clear skies. But please observe safely. Never look directly at the Sun! To locate it, you need to refer to the Minor Planet Center's ephemeris

for Comet ISON. If and when Comet ISON becomes naked-eye visible, we will post finder charts on the website.

Q. When will Comet ISON be visible to me in the sky?
A. First, this depends on the extent to which ISON brightens. The assumption is that it will actually survive perihelion (the point in the orbit of a planet, asteroid or comet where it is nearest to the Sun). Elsewhere on this site we have outlined the possible outcomes for the comet. Again, assuming that Comet ISON actually performs reasonably well, most observers should be able to get at least a glimpse of it in November before it begins to get too close to the Sun. Viewing it during this period will require at least binoculars. Naked eye visibility will hopefully happen in the weeks immediately following Comet ISON's closest point to the Sun. Northern Hemisphere observers should be able to see it into early December. We do not have any viewing charts on this site yet, but point you to amateur astronomer and blogger Stuart Atkinson's ISON Atlas for December 2013, which gives some very nice charts for when and where to look for ISON.

Q. Will Comet ISON survive past the Sun?
A. When the scientists met in August, we had an informal vote amongst our group as to whether we thought ISON would survive passage past the Sun. We were more-or-less divided right down the middle, and again we have no choice but to say "we don't know." Comet ISON will come extremely close to what astronomers call the Roche Limit, which is the distance at which a solid body can pass by a massive gravitational object (i.e. the Sun) before that intense gravitational field literally pulls the object apart. The Roche Limit cannot be applied directly to comets because it assumes a somewhat solid body, and comets, much more like fluffy dirty snowballs, are anything but solid. When we factor in ISON's predicted density and make assumptions about its structural "strength" we find that it sits almost exactly at the Roche Limit, which means that this really could go either way and neither outcome would be a surprise to us.

Q. Is Comet ISON a danger to Earth? Can it change direction and hit Earth?
A. No and No. Some people might snicker or sneer at this question but it is by far the most frequent question we receive, and there is really nothing wrong with asking it. So, for the record, Comet ISON is not going to get anywhere close to being a threat to Earth in any way whatsoever. It will be about 40 million miles (65 million km) away at its closest approach to Earth. It is on a very predictable path through space, and nothing within the laws of physics will move it out of that path.

Observing Comet ISON

Q. When will be the best time to view Comet ISON?
A. Comet ISON should be briefly visible to many observers in late October and early November, but the greatest potential for viewing -- including naked eye viewing -- will be in early to mid-December assuming it survives its pass by the Sun intact.

Q. Where in the sky will the comet be?
A. In general, in the West to West-Northwest, right after Sunset. We don't yet have sky charts on this web site but please refer to amateur astronomer and blogger Stuart Atkinson's ISON Atlas, which gives some very nice charts for when and where to look for ISON during the next few

months.

Q. Are there any locations on Earth that will be better than others for viewing ISON?
A. Having access to dark skies away from city lights will be a huge help! But in general Comet ISON will be much better for Northern Hemisphere observers than those in the Southern Hemisphere. (The latter have been more than spoiled over the past few years with Comet McNaught and Lovejoy, to name but a couple, so the North was due its turn!)

Q. How can I find local events to watch Comet ISON?
A. Events are posted at http://solarsystem.nasa.gov/ison. Feel free to submit your own event too!

Q. I've heard it's going to be the "Comet of the Century"?
A. There is a chance. On the other hand, this century is all of 13 years old, and history is littered with Comet of the Century letdowns and the bitter tears of astronomy fans. We will not know how dazzling Comet ISON might be until it draws closer, and we get a look at how it begins to behave as it nears the Sun.

Q. Why is Hubble looking at it?
A. Hubble is the best tool to study the small comet nucleus -- the source of all the action. In early images, Hubble can also detect the coma and tail. But as the comet gets closer, the coma and tail will become too big for Hubble's field of view, and ground-based astrophotographers will produce the most stunning images. But Hubble will still be able to examine the nucleus best, which will be critical if the comet shatters into pieces.

Q. I've heard it might be as bright as the Sun.
A. That would be cool. But it won't happen. The Sun is really, really, really bright; around 150,000 times brighter.

Q. Will the Solar and Heliospheric Observatory (SOHO) observe Comet ISON?
A. Yes! And in fact we are quite excited about it. Please visit http://sohowww.nascom.nasa.gov/, where you can find a movie of the expected trajectory and examine the Comet ISON orbit via a 3D Java orbit tool. SOHO expects to get a view of the comet from early November 27 to the end of November 30.

Sungrazing Comets

Q. What is a Sungrazing comet?
A. A Sungrazing comet is a comet that gets so close to the Sun it actually grazes its outer atmosphere (called the 'solar corona'). There is no formal definition of how close a comet needs to get to the Sun in order to be called a "Sungrazer," but the CIOC's Matthew Knight did address this in an earlier blog post.

Q. How many Sungrazing comets do we know of?
A. Prior to 1995, there were maybe a dozen or two confirmed Sungrazing comets. Since that time, however, the ESA/NASA SOHO satellite has been operational, and its "coronagraph"

telescope has enabled amateur astronomers and citizen scientists to discover over 2,500 previously unknown comets! In fact Sungrazing comets account for about half of all known comets for which we have orbits!

Q. Is a Sungrazing comet made of different material than a "regular" comet?
A. No, not at all. All comets have slightly different compositions, sizes, densities, etc, but there is nothing unique about Sungrazers in this respect. They just happen to be on an orbit that takes them extremely close to the Sun.

Miscellaneous Questions

Q. Where are the latest NASA images of Comet ISON?
A. Many of you have been very attentive to our observing calendar. We need to remind you of a couple of points:
1) The CIOC is just a coordinating group. We have absolutely no control over what each facility, whether space or ground-based, releases to the public. Most of the facilities also have some restrictions as detailed in a previous blog post and so might not yet have images to release. You should monitor those facility websites or contact those facilities about their images.
2) It takes time to get the data. While ground-based facilities have continuous contact, most space-based assets need to wait to download data. Unfortunately, this doesn't always happen right away because communicating with space assets is an expensive and very limited resource. Priority is given to current/active missions. Some of these space assets used completed their prime missions a long time ago and are not considered active, so they are lower in the queue for downloading data.
3) Observation dates on the calendar are, in most cases, just potential viewing windows with no guarantee that Comet ISON will actually be observed. We do our best to keep the calendar up-to-date. Many things can and sometimes do go wrong. For ground-based facilities, weather can wipe out an entire observing run. For space-based assets, you have the problem of scheduling ISON viewings between regularly scheduled priority targets.

Q. Can I take quotes or images from this website?
A. This website contains exclusively public-domain information, and we stand by all the content we put on here. Thus we do not prohibit individuals from taking quotes and images from the site. What we do ask is that anywhere you quote us; you also include a link back to the page from which the quote was taken. If quoting from a blog post then we request you credit the author of that blog post, and if you quote from a general information page, please credit that page. If you use any of the images that are on the website, be sure to give appropriate credit to the project/observers that took those images. And finally, if you do "quote" from the site, we would ask that you do not quote us out of context or try and change the overall meaning or intent of the page from which the quote was taken.
